

What is claimed is:

1. A drying method for drying a coating layer which is formed by coating a moving web with a coating solution containing organic solvent, comprising steps of:

5 transporting almost vertically and upward said web immediately after the coating;

inclining with one or larger number of guide rollers the upward transporting of said web from an almost vertical direction toward a horizontal direction gradually; and

10 drying said coating layer with a drying device having a casing which surrounds said web just after the coating while disturbance of wind close to a coating surface is prevented, and concentration of said solvent vapor in a side of a surface of said coating layer is kept high.

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2. A drying method claimed in claim 1, wherein said one or plural guide rollers are disposed within said drying device.

3. A drying method claimed in claim 1 or 2, wherein said  
20 transporting direction is directed upwardly with 60° - 90° inclination to a horizontal direction, and said coating surface is positioned upside.

4. A drying method claimed in claim 1, 2 or 3, wherein  
25 velocity of said wind inside said drying device is less than 0.1 m/s in a situation in which the transport of said web is stopped.

5. A drying method claimed in claim 1, 2, 3 or 4 wherein said  
30 coating layer is dried by a heat-drying means disposed downstream from said drying device.

6. A drying method claimed in claim 1, 2, 3, 4, or 5, wherein an interval between a coating position and said first guide roller disposed closest to said coating position within said drying device relative said transporting direction of said web is less than 2m.

7. A drying method claimed in claim 6, wherein other guide rollers disposed downstream from said first guide roller are disposed with at most 2m interval.

8. A drying method claimed in claim 1, 2, 3, 4, 5, 6, or 7, wherein said drying device is disposed within 0.7m after the coating.

9. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7 or 8, wherein a device for condensing and recovering said organic solvent in said coating solution on said coating surface at said transporting position of said web within said drying device.

10. A drying method claimed in claim 9, wherein a plate-like member is used for said device for condensing and recovering.

11. A drying method claimed in claim 9 or 10, wherein each said device is disposed in a space formed by partitioning an inside of said drying device with said guide rollers.

12. A drying method claimed in claim 10 or 11, wherein said plate-like member is provided for a cooling apparatus, and temperature of said plate member is adjustable with use of said cooling apparatus.

13. A drying method claimed in claim 10, 11 or 12, wherein a flow path in which said condensed organic solvent flows in effect of gravity is provided on a surface of said plate-like member.

14. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or 13, wherein side plates are disposed on both sides of said drying device, or said sides are tightly closed so as to prevent said solvent vapor from said coating layer from flowing out of said both sides of said drying device.

15. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 or 14, wherein a content of said organic solvent in said coating solution is at least 50% by mass.

16. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, or 15, wherein said drying device dries at least 70% by mass of said organic solvent contained in said coating solution.

17. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 or 16, wherein there is a heating device in a side of a non-coating surface of a transport position of said web within said drier.

18. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 17, wherein a thickness of said wet coating layer is at most 50  $\mu\text{m}$ .

19. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7, 8,

9, 10, 11, 12, 13, 14, 15, 16, 17 or 18, wherein an extrusion die coater is used to apply said coating solution on said web supported by a back-up member.

5        20. A drying method claimed in claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 or 18, wherein at least a wire bar coater or a graver coater is used to apply said coating solution on said web.

10       21. A drying apparatus for drying a coating layer which is formed by coating a moving web with a coating solution containing organic solvent, comprising:

one or more number of guide rollers for gradually inclining said upwardly transported web just after the coating from an almost vertical direction to a horizontal direction; and  
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a casing for surrounding said web just after the coating, such that disturbance of wind close to a coating surface may be prevented, and a concentration of said solvent vapor in a side of a surface of said coating layer may be kept high.

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22. A drying apparatus claimed in claim 21, wherein a blow-drying apparatus is disposed downstream from said drier.

23. A drying method for drying a coating layer which is formed by coating a moving web with a coating solution containing organic solvent, comprising steps of:

drying said web surrounded by a casing at a transporting position just after the coating with a drying device, so as to prevent disturbance of wind closed to a coating surface, said drying device having a heating means;

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heating with said heating means, such that a temperature

difference  $|T_2 - T_1|$  between a temperature  $T_1$  of said coating layer at an entrance of said drying device and a temperature  $T_2$  of said coating layer at an exit of said drying device at most  $5^{\circ}\text{C}$ .

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24. A drying method as claimed in claim 23, wherein said heating means heats so that a temperature difference  $|T_3 - T_1|$  between said temperature  $T_1$  of said coating layer at said entrance of said drying device and a temperature  $T_3$  of said coating layer  $T_3$  of said coating layer in said drying device is at most  $5^{\circ}\text{C}$ .

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25. A drying method as claimed in claim 23 or 24, wherein said drying device does not blow and discharge a wind.

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26. A drying method as claimed in claim 23, 24 or 25, wherein said drying is made while a solvent vapor above a side of the coating surface within said drying device is kept at high concentration in a middle of drying.

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27. A drying method as claimed in claim 23, 24, 25 or 26, wherein said coating layer is dried by a blow-drying apparatus disposed downstream from said drying device.

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28. A drying method as claimed in claim 23, 24, 25, 26 or 27, wherein said drying device is disposed downstream at most 0.7m after the coating.

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29. A drying method as claimed in claim 23, 24, 25, 26, 27 or 28, wherein a device for condensing and recovering a solvent vapor evaporated from said coating layer is disposed in a side

of a coating surface at a transporting position of said web within said drying device.

30. A drying method as claimed in claim 23, 24, 25, 26, 27,  
5 28 or 29, wherein a content of said organic solvent in said coating solution is at least 50% by mass.

31. A drying method as claimed in claim 23, 24, 25, 26, 27,  
28, 29, 30, wherein said drying device dries at least 70% by  
10 mass of said organic solvent in said coating solution.

32. A drying method as claimed in claim 23, 24, 25, 26, 27,  
28, 29, 30 or 31, wherein an infrared ray heater is used as said  
heating means.

15 33. A drying method as claimed in claim 32, wherein a temperature of water is controlled in the range of 40°C to 80°C with use of said infrared ray heater, and said water is used as said heating means.

20 34. A drying method as claimed in claim 32 or 33, wherein said infrared ray heater has a box shape.

35. A drying method as claimed in claim 32, 33 or 34, wherein  
25 said infrared ray heater is disposed 10mm to 50mm apart from said web.

36. A drying method as claimed in claim 23, 24, 25, 26, 27,  
28, 29, 30, 31, 32, 33, 34 or 35, wherein a guide roller is  
30 disposed within said drying device, and said guide roller is a roller whose temperature is controlled.

37. A drying method as claimed in claim 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35 or 36, wherein a thickness of said wet coating layer is at most 50 $\mu$ m.

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38. A drying apparatus for drying a coating layer which is formed by coating a moving web with a coating solution containing organic solvent, comprising:

10 a drying device disposed at a transporting position just after the coating, while a casing surrounds said web so as to prevent disturbance of wind closed to a coating surface; and

15 a heating means disposed within said drying device for controlling a temperature difference  $|T_3 - T_1|$  at most 5°C between a temperature T1 of said coating layer at an entrance of said drying device and a temperature T3 of said coating layer in said drying device.

39. A drying apparatus for drying a coating layer which is formed by coating a moving web with a coating solution  
20 containing organic solvent, comprising:

a drying device disposed at a transporting position just after the coating, while a casing surrounds said web so as to prevent disturbance of wind closed to a coating surface; and

25 a heating means disposed within said drying device for controlling a temperature difference  $|T_2 - T_1|$  at most 5°C between a temperature T1 of said coating layer at an entrance of said drying device and a temperature T2 of said coating layer at an exit of said drying device.

30 40. A drying apparatus claimed in claim 38 or 39, wherein there is a device for condensing and recovering an organic solvent

in said coating solution on said coating surface at said transporting position of said web within said drying device.

41. A drying apparatus claimed in claim 38, 39 or 40, wherein  
5 a blow-drying apparatus is disposed downstream from said drying device.